

What we claim is:

1 An isolated nucleic acid molecule comprising a polynucleotide having a nucleotide sequence at least 95% identical to a sequence selected from the group consisting of:

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10 (a) a nucleotide sequence encoding the β -galactosidase II polypeptide having the complete amino acid sequence selected from the group consisting of SEQ ID NO:8, SEQ ID NO: 9, SEQ ID NO: 10, SEQ ID NO: 11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO: 15 and SEQ ID NO: 16 and designated TBG1, TBG2, TBG3, TBG4, TBG5, TBG6 and TBG7, respectively as shown in Figure 2 or as encoded by the cDNA clone selected from the group consisting of cDNA clones contained in Gen Bank Accession No. AF023847, AF154420, AF154421, AF020390, AF154423, AF154424 and AF154422;

15 (b) a nucleotide sequence encoding the mature β -galactosidase II polypeptide having the amino acid sequence at about positions 24-724 selected from the group consisting of SEQ ID NO: 8, SEQ ID NO: 9, SEQ ID NO: 10, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15 and SEQ ID NO: 16 and designated TBG1, TBG2, TBG3, TBG4, TBG5, TBG6 and TBG7, respectively as shown in Figure 2 or as encoded by
20 the cDNA clone selected from the group consisting of cDNA clones contained in Gen Bank Accession No. AF023847, AF154420, AF154421, AF020390, AF154423, AF154424 and AF154422; and

25 (c) a nucleotide sequence complementary to any of the nucleotide sequences in (a) or (b), above.

2. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6 and SEQ ID NO:7 as shown in Figure 2.

3. The nucleic acid molecule of claim 1 wherein said polynucleotide has the nucleotide sequence in Figure 2 (SEQ ID NO:4) encoding the β -galactosidase II polypeptide having the amino acid sequence designated TBG4 in Figure 2.

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4. The nucleic acid molecule of claim 1 wherein said polynucleotide has the nucleotide sequence in Figure 2 (SEQ ID NO:4) encoding the mature polypeptide having the amino acid sequence from about 24 to about 724 in the amino acid sequence designated TBG4 in Figure 2.

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5. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF023847.

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6. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF154420.

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7. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF154421.

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8. <sup>sub
a2</sup> The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF020390.

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9. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF154423.

10. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF154424.

11. The nucleic acid molecule of claim 1 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in Gen Bank Accession No. AF154422.

12. <sup>sub
a3</sup> An isolated nucleic acid molecule comprising a polynucleotide which hybridizes under stringent hybridization conditions to a polynucleotide having a nucleotide sequence identical to a nucleotide sequence in (a), (b), or (c) of claim 1 wherein said polynucleotide which hybridizes does not hybridize under stringent hybridization conditions to a polynucleotide having a nucleotide sequence consisting of only A residues or of only T residues.

13. An isolated nucleic acid molecule comprising a polynucleotide which encodes the amino acid sequence of an epitope-bearing portion of a β -galactosidase II polypeptide having an amino acid sequence in (a), (b), or (c) of claim 1.

14. <sup>sub
a4</sup> A method for making a recombinant vector comprising inserting an isolated nucleic acid molecule of claim 1 into a vector.

15. A recombinant vector produced by the method of claim 14.

16. A method of making a recombinant host cell comprising introducing the recombinant vector of claim 15 into a host cell.

17. A recombinant host cell produced by the method of claim 16.

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A recombinant method for producing β -galactosidase II polypeptide, comprising culturing the recombinant host cell of claim 17 under conditions such that said polypeptide is expressed and recovering said polypeptide.

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19. An isolated β -galactosidase II polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:

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a) amino acid sequence at about positions 24-724 selected from the group consisting of sequences SEQ ID NO: 8, SEQ ID NO: 9, SEQ ID NO: 10, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15 and SEQ ID NO: 16 and designated TBG1, TBG2, TBG3, TBG4, TBG5, TBG6 and TBG7, respectively as shown in Figure 2; and

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b) amino acid sequence as encoded by the cDNA clone selected from the group consisting of cDNA clones contained in Gen Bank Accession No. AF023847, AF154420, AF154421, AF020390, AF154423, AF154424 and AF154422.

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20. An isolated polypeptide comprising an epitope-bearing portion of the β -galactosidase II protein.

21. An isolated antibody that binds specifically to a β -galactosidase II polypeptide of claim 20.

Sub
acc) 22. An isolated nucleic acid molecule nucleic acid molecule
comprising a polynucleotide having a nucleotide sequence at least 95%
identical to a sequence selected from the group consisting of:

5 (a) a nucleotide sequence encoding the β -galactosidase II polypeptide
having the complete amino acid sequence selected from the group consisting
of SEQ ID NO:8, SEQ ID NO: 9, SEQ ID NO: 10, SEQ ID NO: 11, SEQ ID
NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO: 15 and SEQ ID NO: 16
and designated TBG1, TBG2, TBG3, TBG4, TBG5, TBG6 and TBG7,
respectively as shown in Figure 3 or as encoded by the cDNA clone selected
10 from the group consisting of cDNA clones contained in Gen Bank Accession
No. AF023847, AF154420, AF154421, AF020390, AF154423, AF154424 and
AF154422;

15 (b) a nucleotide sequence encoding the mature β -galactosidase II
polypeptide having the amino acid sequence at about positions 24-724 selected
from the group consisting of sequences SEQ ID NO: 8, SEQ ID NO: 9, SEQ
ID NO: 10, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO:
14, SEQ ID NO: 15 and SEQ ID NO: 16 and designated TBG1, TBG2, TBG3,
TBG4, TBG5, TBG6 and TBG7, respectively as shown in Figure 3 or as
20 encoded by the cDNA clone selected from the group consisting of cDNA
clones contained in Gen Bank Accession No. AF023847, AF154420,
AF154421, AF020390, AF154423, AF154424 and AF154422; and

(c) a nucleotide sequence complementary to any of the nucleotide
sequences in (a) or (b), above.

25 23. The nucleic acid molecule of claim 22 wherein said
polynucleotide has a complete nucleotide sequence in Figure 2 selected from
the group consisting of SEQ ID NOs: 1-3 and 5-7.

24. The nucleic acid molecule of claim 22 wherein said polynucleotide has a nucleotide sequence in Figure 2 selected from the group consisting of SEQ ID NOs: 1-3 and 5-7 encoding the β -galactosidase polypeptide having the complete amino acid sequence designated TBG1-3 and 5-7, respectively.

25. The nucleic acid molecule of claim 22 wherein said polynucleotide has the nucleotide sequence in Figure 2 selected from the group consisting of SEQ ID NOs: 1-3 and 5-7 encoding the mature polypeptide having the amino acid sequence designated TBG1-3 and 5-7, respectively.

26. The nucleic acid molecule of claim 22 wherein said polynucleotide has the complete nucleotide sequence of the cDNA clone contained in an Gen Bank Accession No. selected from the group consisting of ATCC Deposit No. selected from the group consisting of AF023847, AF154420, AF154421, AF020390, AF154423, AF154424 and AF154422.

27. A method of modifying cell wall metabolism in a plant which comprises transforming said plant with a DNA construct adapted to modify the activity of a β -galactosidase, growing said plant or its descendent and selecting a plant having modified cell wall characteristics, said construct comprising a transcriptional initiation region operative in plants operably linked to a DNA sequence encoding at least one β -galactosidase.

28. A method as claimed in claim 27, wherein said DNA sequence is selected from the group consisting of the sequences of nucleic acid molecules claimed in claim 1 or claim 22.

29. A plant cell transformed with a nucleic acid molecule as claimed in claim 1 or claim 22.

30. A plant derived from a plant cell as claimed in claim 29.

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